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**A TV RECEIVER WITH INDIVIDUALLY  
PROGRAMMABLE SAP CHANNEL**

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Belinda HUNTER

## **A TV RECEIVER WITH INDIVIDUALLY PROGRAMABLE SAP CHANNEL**

### **BACKGROUND OF THE INVENTION**

#### **A. Field of The Invention**

5           This invention pertains to a video signal processor such as a TV receiver that processes a secondary audio program (SAP) channel. The TV receiver is adapted to allow a viewer to customize it by selecting specific audio tracks on the SAP channel that will be processed for each channel.

#### **10 B. Description of the Prior Art**

          Early TV receivers received only a few program channels having a single mono audio track. As TV receivers evolved into the primary source of home entertainment for a majority of the population, program providers and TV manufacturers cooperated to expand the capabilities of TV systems by providing  
15 additional services so that a wide range of video programs could be enjoyed by a more diverse population, including people with various disabilities or people speaking different languages. These services include closed captions (CC) to assist people with hearing disabilities; descriptive video services (DVS), which provide a narrative description of action or other scene related information (for  
20 example, facial expressions), to aid those with visual impairments; and multi-language audio tracks to allow a viewer to select a language he prefers when viewing a program.

viewing a program.

A disadvantage of present TV receivers is that to enable a SAP channel requires an elaborate, often confusing, set-up procedure using a remote control device. And, since a single SAP setting is used universally for all the channels of the TV receiver, the procedure may have to be followed each time a viewer changes channels.

### OBJECTIVES AND ADVANTAGES OF THE INVENTION

An objective is to provide a video signal processor such as a TV receiver that allows a viewer to select an SAP preference for each available channel.

10 Thus the viewer does not have to reprogram his TV receiver for his SAP preferences as he switches channels.

Another objective is to provide a TV receiver adapted to automatically determine what kind of signals are present on the SAP of a particular channel and to select which audio track is active based on this determination and on the preferences previously selected by the viewer.

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A further objective is to provide a TV receiver in which the viewer can select the active audio track either on a channel-by-channel basis, or universally, for all the channels.

Briefly, a video signal processor such as a TV receiver constructed in accordance with our invention processes a composite video signal received from a broadcaster that includes a video channel and a main audio channel which represent standard video and audio programs, and a secondary audio channel that carries an alternative audio track. In one embodiment of the

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invention, the alternative audio track is derived from the standard sound signal, for example, by deleting dialog that may not be suitable for children and replacing the same with milder or more acceptable dialog. In another embodiment, the standard sound signal may be directed to a generic audience while the alternative audio track may be tailored for a specific audience, based, for example, on geographic location.

Advantageously, the TV receiver constructed in accordance with our invention includes a selector (such as a remote control device) adapted to set a viewer's preferences for listening to either the standard audio signals or the alternative audio signals on a channel-by-channel basis, rather than selecting a single preference for all channels as required in prior art TV receivers.

Since the TV receiver includes a video signal processor formed of a tuner and output circuitry generating output video and audio signals, a TV screen and speakers, each of these elements can be provided separately. In this latter configuration, the video signal processor can be provided as a stand-alone device, or can be incorporated into other devices such as VCRs, personal video recorders, DVD players, etc.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**Fig. 1** shows a block diagram of a conventional TV receiver receiving a composite video signal;

**Fig. 1A** shows diagrammatically the conventional video and audio channels imbedded in a composite video signal;

**Fig. 2** shows a block diagram of a TV receiver that processes a

invention; and

**Fig. 2A** shows diagrammatically the video and audio channels imbedded in a composite video signal.

#### DETAILED DESCRIPTION OF THE INVENTION

5            Fig. 1 shows a conventional broadcasting system 10 in which a tower 12 sends a composite video signal CV to a TV receiver 14. TV receiver 14 includes a tuner 16, a pilot signal detector 18, a video decoder 20, an audio decoder 22, an SAP decoder 24 and a multiplexer 26.

10            The TV receiver 14 is controlled by a remote control device 28 which sends a viewer's commands to the TV receiver 14 through an infrared link 30 and an IR receiver 32. Other communication means including ultrasonic or RF signals may be used as well. The remote control device 28 is used by the viewer to perform various functions such as channel selection, volume selection, SAP selection, muting and so on. The output of IR receiver 32 is used by a  
15            decoder 34 to decode the commands from the viewer, for example, to tune tuner 16 to a particular channel. The decoder 34 also controls the operation of a latch 40.

              As shown in Fig. 1A, the composite video signal CV received by receiver 14 may include a video channel, a main audio channel, a pilot signal (P) and a  
20            secondary audio program (SAP) channel. The SAP channel carries either foreign language audio tracks (L) or descriptor video services (DVS) audio tracks.

              When the TV receiver 14 is turned on, the tuner 16 receives the

composite video signal CV and sends it to the video decoder 20, pilot signal detector 18, audio detector 22 and SAP detector 24. The video decoder 20 processes the video signals and generates images on the TV screen 36.

The audio decoder 22 uses the pilot signal P detected by the detector 18.

- 5 The pilot signal P is present when there are sound signals on the SAP channel. The SAP decoder 24 is enabled by pilot signal P and is used to decode the signals on the SAP channel to generate an auxiliary audio track consisting of dialog in a foreign language (L) or DVS.

The TV receiver 14 is programmed by pressing a sequence of

- 10 predetermined keys (not shown) on the remote control device 28. During this process a command is send by the remote control device 28 for the latch 40 so that it is either on or off to indicate whether the SAP channels should be selected or not. The multiplexer selects the active audio track based on the state of the latch 40. The latch 40, audio decoder 22, SAP detector 24 and  
15 multiplexer 26 may be incorporated into a single audio processing chip. However, in Fig. 1 discrete elements are shown for the sake of clarity. When the SAP channel is selected, it remains the "active" audio channel until it is de-selected by the latch 34 through another setup or programming sequence. Details of the structure and operation of the TV receiver 14 are provided for  
20 example in U.S. Patent No. 4,907,082, incorporated herein by reference.

Fig. 2 shows a broadcasting system 10A constructed in accordance with this invention and including a TV receiver 14A. In this system, the composite video signal CVA has been modified so as to include, for each program channel, a signal I indicative of the contents of the SAP signal, i.e., whether the SAP

channel for a particular program carries dialog in a different language (L) or DVS. In addition, the SAP channel may also be used to carry an additional audio track (AA) which is slightly modified version of the main audio track. For example, the auxiliary audio track may be customized for a particular geographic location. Alternatively, portions from the main audio track which may contain objectionable dialogue may be replaced in the auxiliary audio track by a redacted dialogue.

The signal I may be provided in any number of ways. In one advantageous arrangement, the pilot signal P is replaced by a modified signal

- 10 MP (shown in Fig. 2A) which consists of the original pilot signal P which is combined with the signal I using, for instance, amplitude modulation. Therefore TV receiver 14A can determine automatically the contents of the signals on the SAP channel from signal I. For example, signal I can be encoded to indicate the SAP types of signals as follows:

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I	SAP TYPE
1	NONE
2	L=SPANISH
3	L=FRENCH
4	DVS
5	AA

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As indicated in this table a separate value may be assigned for French or Spanish sound tracks, for a DVS or for an alternate audio track. Of course the signal I can be provided many other ways as well.

The components of the TV receiver 14A are similar to the components of the conventional TV receiver 14 in Fig. 1 with several notable exceptions. First, the latch 40 has been replaced by a viewer preference memory 42 and an SAP control circuit 44. In addition the pilot signal detector has been replaced by a combined pilot signal detector and decoder 18A.

The viewer preference memory 42 stores viewer preferences for activation of the SAP channel on a channel-by-channel basis. The data for this memory is entered during the setup process for the TV receiver 14A, at which time the viewer uses remote control device 26 to select an SAP preference (i.e., whether the SAP channel is enabled or not) for each channel based on the programming available on that channel, and other criteria, such as the specific audio tracks provided by the broadcaster on the SAP channel, the geographic location and makeup of the viewer's family, the viewer's preferred language, and so on. For example, the viewer may make the choices indicated in the table below, wherein for M a value of 1 indicates that the SAP channel is the active sound channel and a value of 0 indicates that the main sound channel is the active channel:

CHANNEL	I=1	I=2	I=3	I=4	I=5	M
1		x	x			1
2		x			x	1
3	x		x			0
...	..	...	...	...	...	...
ALL					x	1



This table indicates that the viewer has selected to activate the SAP channel for program channel 1 when the SAP channel contains Spanish dialog or French Dialog. For channel 2 the viewer has opted to activate the SAP if either Spanish dialog or an alternative audio track (AA) is present. For channel 3 the SAP is expressly not selected if a French dialog is present. Obviously, whenever there is no signal on the SAP channel (i.e.,  $I=1$ ) the default value for M is 0.

Finally, as indicated in the table, the viewer may also be given the choice of making a single selection for ALL the channels if he does not want to bother with making individual choices for each program channel. Of course the values for M may be selected using various other types of criteria.

In Fig. 2, the program channel selected by the viewer is provided by the decoder 34 to the tuner 16 and to the SAP control circuit 44. The SAP control circuit 44 then retrieves the value of M from the viewer preference memory 42. For example, referring to the table above, for program channel 2 and an I value of 5 the value of M is 1, meaning that the audio track on the SAP channel should be active channel. Therefore the SAP control circuit 44 sends a control command to the multiplexer 26 to select the SAP channel as the source for the active audio track.

Because the signals on the SAP channel may not always be reliable, the SAP control circuit 44 can monitor the quality of the signals thereon. As long as appropriate SAP signals (typically FM signals) are received on this channel, they are decoded by the SAP decoder 24, and the resulting audio track is provided to speakers 38 through the multiplexer 26. As discussed above, this audio track

may be DVS, dialog in another language, or an alternate audio track modified from the main audio track. If no SAP signal is received, the audio signal to the speakers 38 is muted. The audio signal processing chip 20 may also be structured so that if the SAP channel has been selected and is present, then one of the output lines from the multiplexer 26, for example, the output line for signal L, is used to output the audio track on the SAP channel, while the other output line R is used to generate a monophonic version of the standard audio track on the main audio channel. The following table depicts the typical operation of the circuitry of Fig. 2:

LEFT	RIGHT	SIGNAL RECEIVED	STEREO SELECTED	SAP SELECTED
MUTE	MUTE	POOR OR NOISY SAP	YES	NO
LEFT	RIGHT	STEREO	YES	NO
MONO	MONO	POOR OR NOISY STEREO	NO	YES
MONO	MUTE	POOR OR NOISY SAP	NO	YES
MONO	SAP	SAP	NO	YES
MONO	MUTE	POOR OR NOISY SAP	NO	YES

As discussed above, in conventional systems, the SAP is either enabled or disabled for all the program channels. Therefore, if the SAP is enabled or active and if the particular viewer or family does not speak Spanish or none are visually challenged, then the Spanish and DVS tracks are useless. However, if

the SAP were universally deselected at all times, the viewer would not be able to take advantage of an option for modified family oriented audio tracks, or local information available from the alternative audio tracks. Allowing the viewer to select the setting for each channel separately eliminates these disadvantages.

- 5 The TV receiver 14A may be configured so that the settings can be established or modified only after a code is entered into the remote control device 26, thus preventing unsupervised use by a child.

Preferably, the information in the channel table memory 36 is generated by using the remote control device 26. Of course, the TV receiver 14A may

- 10 have an integral control (not shown) that is disposed in the same housing as the other circuitry shown in Fig. 2.

The TV receiver 14A described above includes in effect a video signal processor having a tuner and output circuitry generating output video and audio signals, a TV screen 36 and speakers 38. However, each of these elements

- 15 may be provided separately. In this latter configuration, the video signal processor may be provided as a self-contained stand-alone unit, or may be incorporated into another device, such as a VCR, a DVD player, a personal video recorder.

Obviously, various modifications may be made to the invention without

- 20 departing from the scope of the invention as defined in the appended claims.